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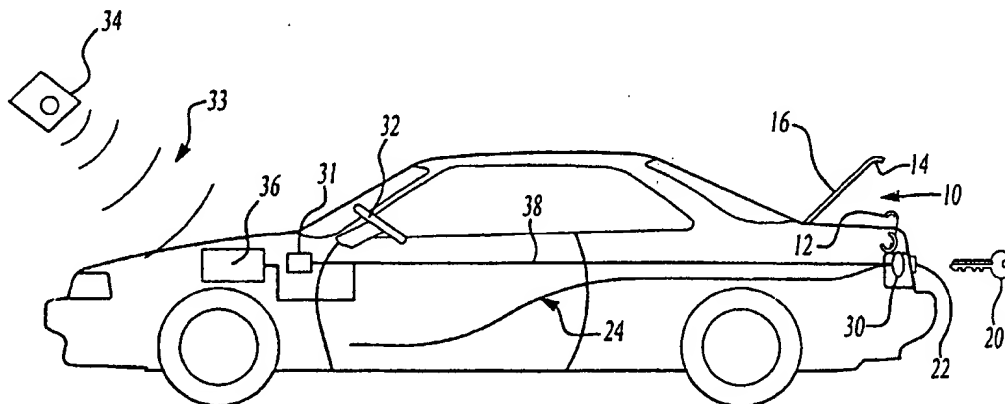


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(54) Title: AUTOMATIC AUTOMOBILE TRUNK RELEASE SYSTEM AND METHOD



(57) Abstract

This invention relates to a system and method for detecting the likely presence of a warm, animate body in a latched confined compartment such as a vehicle trunk, and for taking automatic action in such situations.

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ultrasonic detector to detect breathing

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AUTOMATIC AUTOMOBILE TRUNK RELEASE SYSTEM AND METHOD

Cross-Reference to Related Applications

This application is a continuation of, and claims priority from, US Provisional Application 60/127,031, filed 31 March 1999.

5 BACKGROUND OF THE INVENTION

Technical Field of the Invention

This invention relates to a system and method for detecting the likely presence of a warm, animate body in a latched confined compartment such as a vehicle trunk, and for taking automatic action in such situations.

10 Background Information and Description of the Related Art (Including Information Disclosed Under 37 CFR §§1.97 and 1.98)

Automobile trunks are typically unlatched by using a key or wireless remote from the outside of the automobile, or by actuating a trunk release mechanism from inside the passenger compartment. Until recently, there were no means for releasing the trunk latch from inside the trunk compartment. Now, some manufacturers are providing manual release levers actuable from inside the trunk compartment, such as can be found in US Patents 6,018,292, 5,711,559, 5,445,326, 4,155,233 4,080,812, and 3,992,909. Others are looking to automated means, such as found in US Patents 5,859,479.

20 BRIEF SUMMARY OF THE INVENTION

The present invention is directed to a system and method for causing a vehicle trunk compartment to be automatically unlatched when it is suspected that a person or other living being may have become inadvertently confined.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. 1 is a diagram of a typical vehicle;

FIG. 2 is a diagram of a vehicle trunk having features of the present invention;

5 FIG. 3 is a functional diagram of a preferred embodiment; and

FIG. 4 is a simplified flow chart.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

As shown generally in FIG. 1, most automobiles have a trunk 10, typically
10 located at the rear of the vehicle. A person ordinarily gains access to the interior of
the trunk by disengaging a trunk latch 12 from a trunk striker bolt 14, causing the
trunk lid 16 to open. Inserting and turning a key 20 within the lock cylinder 22 is one
well-known mechanism for releasing the trunk latch. Likewise, one could attach a
cable 24 to the latch release mechanism, so that pulling the cable causes the trunk
15 latch to release the striker.

Many automobiles also provide an electrical device 30, such as a solenoid or
motor, to drive the latch out of engagement with the striker. As such, a user can
press a trunk release button 31 at a remote location, such as near the steering wheel
32, to open the trunk lid.

Remote keyless entry systems build upon this feature by allowing the user to send a radio or infrared trunk release signal 33 from a wireless transmitter 34 to the automobile. A controller 36 of the automobile receives the unlatch signal, and the trunk latch 12 is released. This is generally accomplished by the controller 36

5 sending an unlatch signal via an electrical connection 38 to the electric device 30, to drive the latch out of engagement with the striker.

The operation of all of these latch release schemes are well-known within the art, and need not be described in any greater detail for the purposes of understanding the present invention. The preferred embodiment described here

10 assumes there is some form of electrically actuatable release mechanism, so that the trunk can be unlatched using other than manual means.

FIG. 2 depicts the interior of an exemplary vehicle trunk. Infrared sensors 50, 52 are mounted within the trunk compartment. These sensors detect variations in heat and movement. The sensors 50, 52 are electrically connected 54, 56 to the vehicle electrical system so as to receive power and return signals representative of their sensed values. Each sensor senses heat and motion within its field of vision. These fields of vision are figuratively depicted as detection array vectors 58 and 59. Sensors for detecting heat variations and motion are well-known in the art, and their precise operation need not be detailed here to understand the present invention. The sensors 50, 52 are aimed so that their fields of vision 58, 59 adequately entail the majority of the trunk compartment. In this way, anything (larger than a nominal size) contained within the trunk compartment would fall within the field of one or more of the sensors. As can be appreciated by those of ordinary skill, while this embodiment depicts two sensors located at diametric corners of the trunk, more or fewer sensors located in similar or different positions could be used to suit the needs of the particular situation.

FIG. 3 depicts the function of the preferred embodiment of the present invention. The trunk release controller 36 is electrically connected 38 to the trunk latch solenoid 30. When energized, the solenoid 30 causes the trunk latch 12 to be moved, releasing the trunk lid. The solenoid is operated under normal conditions by one of two means. Depressing a trunk release button 31 directly energizes the solenoid 30. The other method of actuating the solenoid is by emitting an unlatch signal 33 from a transmitter 34, which is received by the trunk controller 36. The trunk controller 36 then energizes the solenoid 30.

To unlatch the trunk automatically, at least one of the heat and motion sensors 50, 52 must detect the likely presence of a warm or moving object. The detection signal is electrically transmitted 54, 56 to the trunk controller 36, and the solenoid 30 is energized to release the latch 12.

5 The goal of the present invention is to automatically unlatch the trunk only when it is likely that there is a person or animal accidentally trapped within the trunk. If only detected motion were required to effect an automatic trunk release, there may be situations where the trunk would unlatch when it is in fact less likely that there is something animate trapped within. For example, inanimate contents of the trunk
10 may shift while the vehicle is in motion. To avoid inadvertently unlatching the trunk due to the shifting of inanimate objects, the preferred embodiment includes a connection 98 whereby a velocity or acceleration signal is provided to the trunk controller 36. This connection 98 interfaces to the engine or body controller 100, which is responsible (among other things) for processing signals such as wheel
15 speed 102, vehicle acceleration 104 and engine speed 106.

FIG. 4 shows a simplified flow chart of an algorithm for effecting the preferred embodiment. The automatic release features are not yet invoked when the vehicle is in motion if only movement, and no heat signature, is detected within the trunk. This is shown as logic path 200, 202, 204, 206, 208. On the other hand, heat and movement signatures detected during vehicle movement would result in the controller 36 setting the unlatch signal. This is shown as logic path 200, 202, 204, 210. The automatic release could be effected immediately, however in this embodiment it is temporarily inhibited until the vehicle speed has fallen below a desired threshold. This is logic path 210, 212. Employing an inhibition threshold would avoid opening the trunk when the vehicle is traveling at high speeds. During successive iterations, the temporarily inhibited unlatch command would be effected as soon as the vehicle speed falls below the threshold. This is logic path 214, 216, 212, 218.

The present invention also is adapted to handle situations where the trapped person or animal falls unconscious, and thus becomes inanimate, before the controller 36 can effect an unlatch signal 38. In those situations, mere detection of an appropriate heat signature is sufficient to effect unlatching. This is logic path 202, 220. During successive iterations, earlier detected movement while the vehicle is in motion is combined with any detected heat signature. If a heat signature is then detected, an unlatch is requested. This is logic path 214, 222, 220, 210. Then, depending upon whether the vehicle speed is above or below the threshold 212, the trunk is unlatched.

One of ordinary skill can appreciate that the sensors 50, 52 could alternatively be ultrasonic and designed to detect an acoustic signature representative of breathing. Likewise, the sensors could alternatively be carbon dioxide/oxygen sensors designed to detect the falling oxygen levels and rising carbon dioxide levels typical of someone or something breathing in a confined

space. In the alternative, or in combination with any of the above, touch sensors

One of ordinary skill would be able to readily adapt the embodiment disclosed here, without engaging in undue experimentation, to employ these and other types of sensors.

CLAIMS

I/we claim as follows:

1. An emergency trunk latch release system for a trunk having a trunk lid and a latch for locking the trunk lid closed, the system comprising:
 - an electromechanical trunk latch release for releasing the trunk latch;
 - a sensor for sensing a person inside the trunk; and
 - 5 a controller connected to said trunk latch release and said sensor; said controller being constructed and arranged to activate said electromechanical trunk latch release upon said sensor sensing a person inside the trunk.
2. An emergency trunk latch release system as claimed in claim 1, wherein said trunk is part of a motor vehicle, said motor vehicle having a vehicle motion sensor connected to said controller, wherein said controller activates said electromechanical trunk latch release only when said vehicle motion sensor senses that said vehicle is
5 at rest.
3. An emergency trunk latch release system as claimed in claim 1, wherein said sensor comprises a motion sensor for detecting motion within said trunk.
4. An emergency trunk latch release system as claimed in claim 3, wherein said motion sensor further comprises a heat sensor.

5. An emergency trunk latch release system as claimed in claim 1, wherein said electromechanical trunk latch release has a manual release lock, and the latch release system overrides said manual release lock when activating said latch release.

6. A method for releasing a motor vehicle trunk latch when a person is trapped in the trunk, the method comprising:

electronically sensing the presence of a person in the trunk;

5 after said sensing the presence of a person in the trunk, electronically activating an electromechanical trunk latch release to release the vehicle trunk latch.

7. A method as claimed in claim 6, wherein said step of sensing the presence of a person in the trunk comprises sensing motion of the person.

8. A method as claimed in claim 7, wherein said step of sensing the presence of a person in the trunk further comprises sensing heat radiating from the person.

9. A method as claimed in claim 6, further comprising the step of sensing that the vehicle is at rest, wherein said step of activating an electromechanical trunk latch release is performed after said sensing that the vehicle is at rest.

10. A system for detecting the presence of a victim trapped in a motor vehicle trunk, the system comprising:
- a sensor for sensing the victim inside the trunk;
 - a rescue mechanism for initiating a rescue of the victim; and
 - 5 a controller connected to said rescue mechanism and said sensor; said controller being constructed and arranged to activate said rescue mechanism upon said sensor sensing a person inside the trunk.
11. A system as claimed in claim 10, wherein said rescue mechanism is a vehicle security alarm.
12. A system as claimed in claim 10, wherein said rescue mechanism is an electromechanical trunk latch release.
13. A system as claimed in claim 10, wherein said rescue mechanism is an electromechanical trunk latch release in conjunction with a vehicle security alarm.

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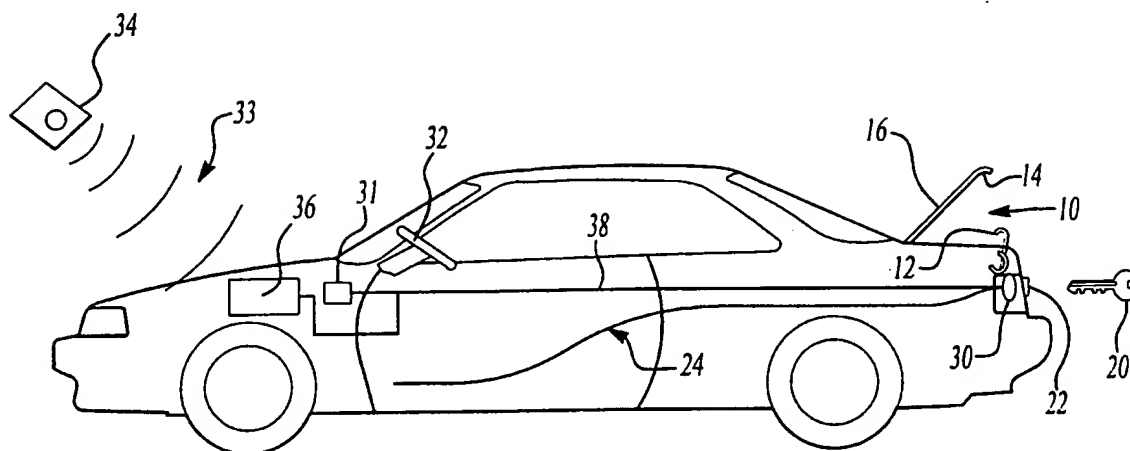
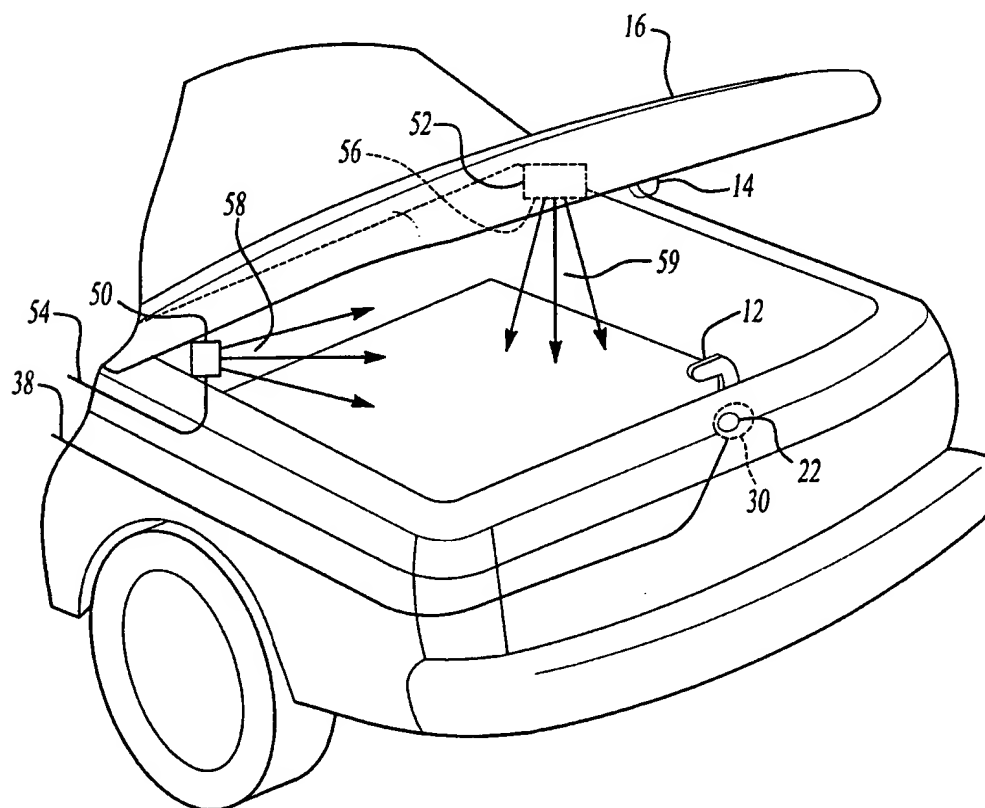
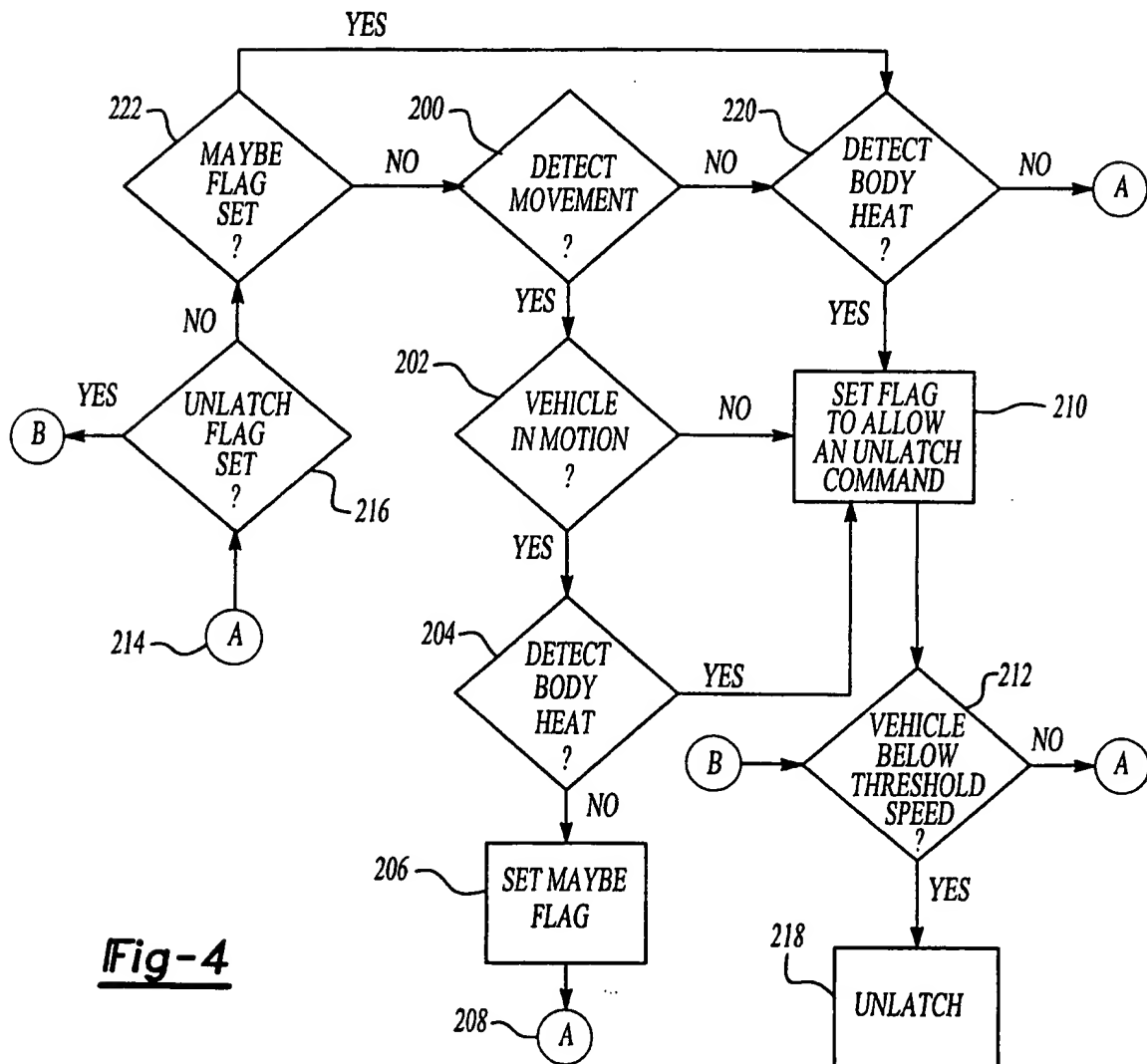
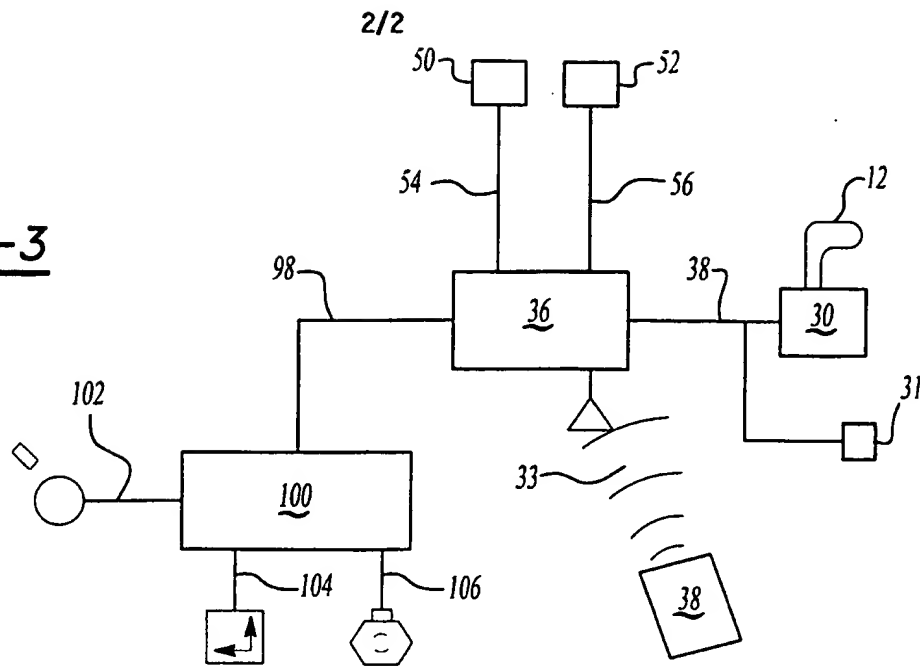
Fig-1Fig-2

Fig-3**Fig-4**

INTERNATIONAL SEARCH REPORT

Inter. Application No

PCT/US 00/08815

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 E05B65/19 G01S13/56 B60R25/00

According to International Patent Classification (IPC) or to both national classification and IPC

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 04119 A (KIM SEONG SOO) 28 January 1999 (1999-01-28) page 8, line 21 -page 13, line 12 page 23, line 8 - line 13 page 25, line 27 -page 26, line 29; figure 2 ---	1-13
P,X	DE 198 36 935 C (LANGENBERG HARTWIG) 30 March 2000 (2000-03-30) column 1, line 37 -column 2, line 44; claims 1-4; figure 3 ---	1,3-8, 10-13
A	US 5 793 291 A (THORNTON CAROLYN M) 11 August 1998 (1998-08-11) column 1, line 58 -column 2, line 9; figure 2 --- -/--	1,3-8



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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5 859 479 A (DAVID ELLIS MORTON) 12 January 1999 (1999-01-12) cited in the application column 3, line 16 -column 4, line 14; figure 2</p> <p>-----</p>	1,6,10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/08815

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